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## *Hazards of Ultraviolet Light*

UV or ultraviolet lamps are used in biological safety cabinets, light boxes, and crosslinkers in many University laboratories and in some patient care rooms. One of the problems in working with UV radiation is that the symptoms of overexposure are not immediately felt so that persons exposed do not realize the hazard until after the damage is done.

UV radiation is that radiation just outside the visible range, or under 400 nanometers (nm). There are three ranges of UV (see table below).

Region	Also known as	Range in nm	Hazard Potential
UV-A	near UV	320-400	low
UV-B	mid UV	290-320	mid to high
UV-C	far UV	190-290	high

*(Early "black lights" emitted in the range of 360-390 nm.)*

### *Health Effects*

The biological effects of the 3 regions vary greatly as implied by the "hazard potential" column in the table. The health effects of exposure to UV light are familiar to anyone who has had a sunburn. However, the UV light levels around some UV equipment greatly exceeds the levels found in nature. Acute (short-term) effects include redness, ulceration of the skin. At high levels of exposure, these burns can be serious. For chronic exposures, there is also a cumulative risk of harm. This risk depends upon the amount of exposure during your lifetime. The long-term risk for large cumulative exposure includes premature aging of the skin and even skin cancer.

**UV exposures not immediately felt . . . user may not realize hazard until after damage is done.**

The eyes are also susceptible to UV damage. Like the skin, the covering of the eye (the cornea), is epithelial tissue, too. The danger to the eye is enhanced by the fact that light can enter from all angles around the eye and not only in the direction you are looking. The lens can also be damaged, but since the cornea acts as a filter, the chances are reduced. This should not lessen the concern over lens damage however because cataracts are the direct result of lens damage.

Burns to the eyes are usually more painful and serious than a burn to the skin. Make sure your eye protection is appropriate for this work. There are specially-made safety glasses for the different UV ranges. **NORMAL EYEGLASSES OR CONTACTS OFFER YOU VERY LIMITED PROTECTION!!**

You must not forget to protect the rest of your face, too. Severe skin burns can happen in a very short time, especially under your chin (where most people forget to cover). Face shields are really the only appropriate protection when working with UV light because for more than a few seconds.

Be sure to protect your arms and hands by wearing a long-sleeve lab coat and gloves.

### ***Equipment Uses***

*Germicidal lamps* emit radiation almost exclusively in the far-UV range of 254 nm, and are commonly used in Laminar Air Flow hoods or biological safety cabinets and should be treated with extreme caution. **DO NOT** expose yourself to these lights!

The *UV light box* is another source in use in the laboratory. This instrument is literally a box with a glass top and a UV lamp inside. Some units have multiple lamps that allow a choice of wavelength. Most of these instruments are stationary, but there are a few hand held types that carry the same hazards as the stationary models. Nucleic acid (DNA or RNA) which has been stained with the chemical Ethidium Bromide, lights up when exposed to UV light.

<p><b>[What makes Ethidium Bromide an excellent stain, also makes it toxic and mutagenic and should never be used without gloves!]</b></p>
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An apparatus called a *UV-Crosslinker* is used to literally "cross-link" to covalently attach nucleic acid to a surface or membrane following Southern blotting, Northern blotting, dot blotting, and Colony/Plaque lifts. Since the DNA will be used in place, a 254 nm wavelength is used to maximize adherence.

Adapted from the California Campus Environmental Health & Safety Association Winter 1995 Newsletter *What You Should Know About UV Light*

### ***Accidental UV Exposure***

*A University lab employee received skin and eye burns while using an acrylic plastic shield for protection against UV. The lab did not realize that the shield had not been*

manufactured for this use and was not rated for protection against UV light. Please check your safety equipment to ensure that it is rated for the wavelength in use.

### ***UV questions and answers***

*How do I know if my eye protection is rated for UV safety? Look for a symbol indicating rating for UV protection or check with the manufacturer. If no information is available you should purchase a new face shield or safety glasses.*

*How can I work safely around a bio cabinet or germicidal lamp? The UV lamp should never be left on when the hood is open. Even a small opening at the bottom of the cabinet can exceed occupational exposure standards several feet away.*

*How would I know if exposure from a UV emitting device is excessive? Call Radiation Safety at 543-0463 to schedule a UV safety survey. Be sure to mention your name, telephone number, the room number, and the type of device you are working with.*

### ***Glycol Ethers***

Glycol ethers can be found both in laboratories and commercial products such as solvents, cleaning agents, airplane wing de-icers, brake fluid, etc. They go by a variety of names, including Cellosolve (or any butyl- or methyl- or ethyl- variant of this), 2-methoxyethanol, 2-ethoxyethanol, ethylene glycol monomethyl ether, 2-EE, 2-ME, PGME, etc. Some UW lab workers and custodial workers probably use some of these products containing them.

In recent years, these chemicals have been found to have teratogenic effects and to cause reproductive difficulties for both men and women. OSHA has greatly lowered Permissible Exposure Limits (PEL) for these chemicals, but NIOSH recommends far more drastic limits - from 10 to 400 times lower than OSHA's since these chemicals are in such frequent use.

One of the special things about these chemicals is that they are absorbed through skin very efficiently. In most cases, someone using one of these will absorb far more through the skin than through the lungs. This means that good chemical-resistant gloves (nitrile, not latex) are essential when using these chemicals.

The new lower exposure limits and NIOSH recommendations are based on the teratogenic and reproductive hazards only; in other respects this class of compound doesn't seem to be much worse than other solvents and cleaning agents. We suggest that any pregnant woman (especially in the first trimester) or any woman who is planning a pregnancy or any man who contemplates fathering a child in the near future be careful about their exposure to any of these chemicals.

<b><i>Be especially sure you're wearing good chemical resistant gloves.</i></b>
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If you're planning on having your carpets cleaned, ask what's in the cleaning solution.

*Think about how much you really need that labor-saving spray cleaner.*

*EH&S Health and Safety Update is published by the Environmental Health and Safety Department to advise on accident prevention and health concerns. Readers may want to retain a file or ringbinder of newsletters for future reference. Questions on newsletter content or ideas for articles should be communicated to John Eriksen, Box 354400, 543-7201, or [jeriksen@u.washington.edu](mailto:jeriksen@u.washington.edu).*



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